

WHAT IS CLAIMED IS:

1. An electrochemical cell for separating a first gas from a mixture of gas comprising:
a first electrode;
a second electrode; and
a hydroxide-conducting membrane between the first electrode and the second electrode.
2. The electrochemical cell as in claim 1, wherein the membrane comprises a composite of a molecular structure and a hydroxide-conducting medium.
3. The electrochemical cell as in claim 2, wherein the molecular structure comprises a polymeric structure.
4. The electrochemical cell as in claim 3, wherein the polymeric structure is cross-linked.
5. The electrochemical cell as in claim 4, wherein the polymeric structure comprises a polymerization product of one or more monomers selected from the group of water soluble ethylenically unsaturated amides and acids.
6. The electrochemical cell as in claim 5, wherein the polymeric structure further comprises a water soluble or water swellable polymer.

7. The electrochemical cell as in claim 6, wherein the polymeric structure water soluble or water swellable polymer is selected from the group consisting of polysulfone, poly(sodium 4-styrenesulfonate), carboxymethyl cellulose, sodium salt of poly(styrenesulfonic acid-co-maleic acid), corn starch and combinations comprising at least one of the foregoing water soluble or water swellable polymers.

8. The electrochemical cell as in claim 6, wherein the polymeric structure is formed on a substrate.

9. The electrochemical cell as in claim 8, wherein the substrate is selected from the group consisting of polyolefin, polyvinyl alcohol, cellulose and polyamide.

10. The electrochemical cell as in claim 5, wherein the hydroxide-conducting medium is added prior to polymerization.

11. The electrochemical cell as in claim 5, wherein the hydroxide-conducting medium is added after polymerization.

12. The electrochemical cell as in claim 5, wherein the one or more monomers is selected from the group consisting of methylenebisacrylamide, acrylamide, methacrylic acid, acrylic acid, 1-vinyl-2-pyrrolidinone, N-isopropylacrylamide, fumaramide, fumaric acid, N, N-dimethylacrylamide, 3,3-dimethylacrylic acid, the sodium salt of vinylsulfonic acid and combinations comprising at least one of the foregoing monomers.

13. The electrochemical cell as in claim 5, wherein the polymeric structure further comprises a cross-linking agent.

14. The electrochemical cell as in claim 13, wherein the cross-linking agent is selected from the group consisting of methylenebisacrylamide, ethylenebisacrylamide, any water-soluble N,N'-alkylidene-bis(ethylenically unsaturated amide) and combinations comprising at least one of the foregoing crosslinking agents.

15. The electrochemical cell as in claim 5, wherein the polymeric structure further comprises a polymerization initiator.

16. The electrochemical cell as in claim 15, wherein the polymerization initiator is selected from the group consisting of ammonium persulfate, alkali metal persulfates and peroxides and combinations comprising at least one of the foregoing initiators.

17. The electrochemical cell as in claim 1, wherein the electrolyte consists essentially of a composite of a molecular structure and a hydroxide-conducting medium.

18. The electrochemical cell as in claim 17, wherein the molecular structure comprises a polymeric structure.

19. The electrochemical cell as in claim 18, wherein the polymeric structure is cross-linked.

20. The electrochemical cell as in claim 18, wherein the polymeric structure comprises a polymerization product of one or more monomers selected from the group of water soluble ethylenically unsaturated amides and acids.

21. The electrochemical cell as in claim 20, wherein the polymeric structure further comprises a water soluble or water swellable polymer.

22. The electrochemical cell as in claim 21, wherein the polymeric structure water soluble or water swellable polymer is selected from the group consisting of polysulfone, poly(sodium 4-styrenesulfonate), carboxymethyl cellulose, sodium salt of poly(styrenesulfonic acid-co-maleic acid), corn starch and combinations comprising at

5 least one of the foregoing water soluble or water swellable polymers.

23. The electrochemical cell as in claim 20, wherein the polymeric structure is formed on a substrate.

24. The electrochemical cell as in claim 23, wherein the substrate is selected from the group consisting of polyolefin, polyvinyl alcohol, cellulose and polyamide.

25. The electrochemical cell as in claim 20, wherein the hydroxide-conducting electrolyte is added prior to polymerization.

26. The electrochemical cell as in claim 20, wherein the hydroxide-conducting electrolyte is added after polymerization.

27. The electrochemical cell as in claim 20, wherein the one or more monomers is selected from the group consisting of methylenebisacrylamide, acrylamide, methacrylic acid, acrylic acid, 1-vinyl-2-pyrrolidinone, N-isopropylacrylamide, fumaramide, fumaric acid, N, N-dimethylacrylamide, 3,3-dimethylacrylic acid, the sodium salt of vinylsulfonic acid and combinations comprising at least one of the foregoing monomers.

28. The electrochemical cell as in claim 20, wherein the polymeric structure further comprises a cross-linking agent.

29. The electrochemical cell as in claim 28, wherein the cross-linking agent is selected from the group consisting of methylenebisacrylamide, ethylenebisacrylamide, any water-soluble N,N'-alkylidene-bis(ethylenically unsaturated amide) and combinations comprising at least one of the foregoing crosslinking agents.

30. The electrochemical cell as in claim 29, wherein the polymeric structure further comprises a polymerization initiator.

31. The electrochemical cell as in claim 30, wherein the polymerization initiator is selected from the group consisting of ammonium persulfate, alkali metal persulfates and peroxides and combinations comprising at least one of the foregoing initiators.

32. The electrochemical cell as in claim 1, wherein the membrane comprises a substrate supporting a hydroxide-conducting medium.

33. The electrochemical cell as in claim 32, wherein the substrate is selected from the group consisting of woven materials, non-woven materials, porous materials, cellular materials and polymer sheets.

34. The electrochemical cell as in claim 32, wherein the hydroxide-conducting medium comprises an electrolyte and a gelling agent.

35. The electrochemical cell as in claim 1, wherein the membrane comprises an anion exchange membrane.

36. The electrochemical cell as in claim 35, wherein the anion exchange membrane comprises a polymer having quaternary salt functional groups.

37. The electrochemical cell as in claim 1, wherein the first gas is oxygen and the mixture of gas is air.

38. The electrochemical cell as in claim 2, wherein the first gas is oxygen and the mixture of gas is air.

39. The electrochemical cell as in claim 17, wherein the first gas is oxygen and the mixture of gas is air.

40. The electrochemical cell as in claim 32, wherein the first gas is oxygen and the mixture of gas is air.

41. The electrochemical cell as in claim 35, wherein the first gas is oxygen and the mixture of gas is air.

42. The electrochemical cell as in claim 1, further comprising a voltage source for applying a voltage across the a first electrode and the a second electrode.

43. The electrochemical cell as in claim 1, further comprising a conductor between the a first electrode and the a second electrode.